UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I – NEW ENGLAND
5 POST OFFICE SQUARE – SUITE 100
BOSTON, MASSACHUSETTS 02109-3912

FACT SHEET

DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES

NPDES PERMIT No.: **NH0100765**

PUBLIC NOTICE START AND END DATES: April 8th, 2010 – May 7th, 2010

NAME AND ADDRESS OF APPLICANT:

Town of Charlestown
26 Railroad Street
P.O. Box 385
Charlestown, New Hampshire 03603

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Charlestown Wastewater Treatment Plant
187 Lower Landing Road
Charlestown, New Hampshire 03603

RECEIVING WATER: **Connecticut River (Hydrologic Basin Code: 01080106)**

CLASSIFICATION: **B**

TABLE OF CONTENTS

I. PROPOSED ACTION

The above named applicant has applied to the U.S. Environmental Protection Agency (EPA) for reissuance of its National Pollutant Discharge Elimination System (NPDES) permit to discharge treated effluent into the designated receiving water, the Connecticut River. The most recent permit was issued to the facility on August 20, 1999 and expired on August 20, 2004. This permit, hereafter referred to as the current permit, was administratively continued pursuant to 40 CFR § 122.6, as a timely and complete application for permit reissuance was filed by the permittee. As drafted, the permit and the authorization to discharge will expire at midnight, five (5) years from the effective date.

II. TYPE OF FACILITY AND DISCHARGE LOCATION

The Charlestown Wastewater Treatment Plant (WWTP) is a publicly owned treatment works (POTW) that provides secondary treatment to sanitary wastewater collected from residences and a small number of industries in town using a two-stage aerated lagoon system. The facility has a design flow of 1.1 million gallons per day (MGD). Raw wastewater entering the facility flows through a flow measuring device and then into a grit removal facility (where the influent sampling station is also located). Grit is removed from the wastewater by a vortex-type unit and a grit washing screw. The wastewater then flows into the two-stage aerated lagoon system where it undergoes secondary (biological) treatment. The lagoons are aerated by an air blower-diffuser system which facilitates the aerobic decomposition of organic matter in the wastewater. The treated effluent then flows through a chlorine contact chamber for disinfection, followed by dechlorination prior to being discharged through outfall 001 into the Connecticut River (see **Figure 1**). Naturally occurring biological processes within the lagoons used in the treatment of wastewater at the facility significantly reduce the amount of sludge generated during treatment. As a result, sludge removal from the lagoons is rarely necessary. The location of the Charlestown WWTP and a process flow diagram are shown in **Figures 1** and **2**, respectively.

The entire collection system consists of separate sanitary sewers. Information provided in the permittee's re-application states that the facility serves a population of approximately 2,400. The facility does not discharge on a continual basis. According to information submitted by the permittee in their re-application, discharges occur 24-28 times per year, with the average duration of each discharge being five days. The facility discharged 28 times for a total of 159 days in 2009.

In the past, discrepancies between the flow into and out of the lagoons led to suspicions that the lagoons, which are unlined, might be leaking. To address any potential groundwater infiltration from the lagoons, the Charlestown Wastewater Treatment Plant is covered under a groundwater discharge permit issued by the State of New Hampshire (permit number GWP-199105077C-001). The lagoons were drawn down in June 2002 so that the condition of the lagoons as well as sludge depth could be evaluated. The inspection found the lagoons to be in very good condition, and the sludge depth was determined to be moderate in the primary lagoon and very low in the secondary lagoon.

The geographic coordinates of discharge outfall 001 are listed below:

Outfall No.	Description of Discharge	Outfall Location
001	Secondary Wastewater Treatment Plant Effluent	43º13.588/72º25.950

III. DESCRIPTION OF THE DISCHARGE

A quantitative description of the discharge in terms of significant effluent parameters based on recent monitoring data can be found in **Appendices A, B,** and **C**.

IV. LIMITATIONS AND CONDITIONS

The draft permit contains effluent limitations for five-day Biochemical Oxygen Demand (BOD_5), total suspended solids (TSS), pH, *Escherichia coli (E. coli),* total residual chlorine (TRC), and whole effluent toxicity (WET). In addition, the draft permit contains monitoring requirements for flow, total nitrogen, total kjeldahl nitrogen, total nitrite nitrogen, total nitrate nitrogen, total ammonia nitrogen, hardness, aluminum; and total recoverable cadmium, chromium, copper, lead, nickel, and zinc. The effluent limitations and monitoring requirements may be found in Part I of the draft NPDES permit.

The basis for each limitation and monitoring requirement found in the draft permit is discussed further in this fact sheet.

V. PERMIT BASIS AND EXPLANATION OF EFFLUENT LIMITATION DERIVATION

A. General Statutory and Regulatory background

Congress enacted the Clean Water Act (CWA) "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (CWA § 101(a)). To achieve this objective, the CWA makes it unlawful for any person to discharge any pollutant into waters of the United States from any point source, except as authorized by specified permitting sections of the CWA, one of which is Section 402 (see CWA §§ 301(a) and 402(a)). Section 402 establishes one of the CWA's principal permitting programs, the National Pollutant Discharge Elimination System (NPDES). Under this section of the CWA, EPA may "issue a permit for the discharge of any pollutant or combination of pollutants" in accordance with certain conditions (see CWA § 402(a)). NPDES permits generally contain discharge limitations and establish related monitoring and reporting requirements (see CWA § 402(a)(1) and (2)).

Section 301 of the CWA provides for two types of effluent limitations to be included in NPDES permits, technology-based effluent limitations and water quality-based effluent limitations (see CWA §§ 301, 303, and 304(b). Also see 40 CFR § Parts 122, 125, and 131). Technology-based limitations, generally developed on an industry-by-industry basis,

reflect a specified level of pollutant reducing technology available and economically achievable for the type of facility being permitted (see CWA §301(b)). As a class, POTWs must meet performance-based requirements which are based upon secondary treatment. The secondary treatment technology guidelines (effluent limits) consist of technology-based requirements expressed in terms of BOD_5, TSS, and pH (see 40 CFR Part 133).

Water quality-based effluent limitations are developed and incorporated into NPDES discharge permits regardless of the decision made with respect to technology and economics in establishing technology-based limits. Specifically, Section 301(b)(1)(C) of the CWA requires achievement of "any more stringent limitation, including those necessary to meet water quality standards…established pursuant to any State law or regulation…" See 40 CFR §§ 122.4(d), 122.44(d)(1) (providing that a permit must contain effluent limits as necessary to protect State water quality standards, "including State narrative criteria for water quality") (emphasis added) and § 122.45(d)(5) providing in part that a permit incorporate any more stringent limits required by Section 301(b)(1)(C) of the CWA).

The CWA requires that states develop water quality standards for all water bodies within the state (see CWA § 303). Water quality standards consist of three elements: (1) one or more designated use for each waterbody or waterbody segment in the state; (2) water quality criteria consisting of numerical concentration levels and/or narrative statements specifying the amounts of various pollutants that may be present in each waterbody without impairing the designated use(s) of that waterbody; and (3) an antidegradation provision focused on protecting high quality waters and protecting and maintaining the level of water quality necessary to protect existing uses (CWA § 303(c)(2)(a) and 40 CFR § 131.12). The limits and conditions contained within the draft permit reflect the goal of the CWA and EPA to achieve and then to maintain water quality standards within the receiving water.

The applicable New Hampshire water quality standards can be found in the New Hampshire Code of Administrative Rules, Surface Water Quality Regulations, Chapter Env-Wq 1700 et seq. See generally, Title 50, Water Management and Protection, Chapter 485A, Water Pollution and Waste Disposal Section 485-A. These regulations were readopted effective May 21, 2008.

Receiving stream requirements are established according to numerical and narrative standards adopted under state law for each stream classification. When using chemical-specific numeric criteria from a state's water quality standards to develop permit limits, both the acute and chronic aquatic life criteria are used and expressed in terms of maximum allowable instream pollutant concentrations. Acute and chronic aquatic life criteria are generally implemented through maximum daily limits and average monthly limits, respectively. When a state has not established a numeric water quality criterion for a specific pollutant that is present in the effluent in a concentration that causes or has the reasonable potential to cause or contributes to a violation of a narrative criterion within a water quality standard, the permitting authority must establish limits in one or more of the

following ways: (1) based on a calculated numeric criterion for the pollutant which the permitting authority demonstrates will attain and maintain applicable narrative water quality criteria and fully protect the designated uses; (2) on a case-by-case basis using CWA § 304(a) recommended water quality criteria, supplemented as necessary by other relevant information; or (3) in certain circumstances, based on an indicator parameter (40 CFR § 122.44(d)(1)(vi)(A-C)).

Under Section 301(b)(1) of the CWA, POTWs must have achieved effluent limitations based upon secondary treatment by July 1, 1977. Since all statutory deadlines for meeting technology-based effluent limitations established pursuant to the CWA have expired, the deadline for compliance with technology-based effluent limits for a POTW is the date of permit issuance (40 CFR § 125.3(a)). Extended compliance deadlines cannot be authorized by a NPDES permit if statutory deadlines have passed. The federal regulations governing EPA's NPDES program are generally found in 40 CFR Parts 122, 124, and 136.

B. Introduction

Pursuant to 40 CFR § 122.44(d)(1), NPDES permits must contain any requirements in addition to technology-based limits necessary to achieve water quality standards established under Section 303 of the CWA, including state narrative criteria for water quality. In addition, limitations "must control any pollutant or pollutant parameter (conventional, non-conventional, or toxic) which the Director determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any water quality standard, including State narrative criteria for water quality (40 CFR § 122.44(d)(1)(i)). An excursion occurs if the actual or projected instream concentration exceeds the applicable criterion.

The Charlestown WWTP discharges treated effluent to the Connecticut River, which is classified by the State of New Hampshire as a Class B water. Class B waters shall be of the second highest quality and shall have no objectionable physical characteristics, and shall contain a dissolved oxygen content of at least 75 percent saturation (see RSA 485-A:8). The following designated uses are assigned to Class B waters: the protection and propagation of aquatic life and wildlife, for swimming and other recreational purposes; and, after treatment, for water supplies.

Sections 305(b) and 303(d) of the CWA require that states complete a water quality inventory and develop a list of impaired waters. Specifically, Section 303(d) of the CWA requires states to identify those water bodies that are not expected to meet surface water quality standards after the implementation of technology-based controls, and as such, require the development of a Total Maximum Daily Load (TMDL) for each pollutant that is prohibiting a designated use(s) from being attained. The results of the 305(b) assessments are used in the development of the State of New Hampshire's 303(d) lists, which are published every two years and identifies the water bodies which are not meeting (or are not expected to meet) water quality standards, identifies the designated use(s) which is impaired and also the pollutant(s) causing the impairment(s).

The segment of the Connecticut River into which the Charlestown WWTP discharges, as well as the segment immediately downstream (Assessment Unit IDs: NHIMP801060703-05 and NHRIV801070501-10-01), are identified in the *State of New Hampshire Final 2008 Section 303(d) Surface Water Quality List* (NHDES 2008) as not meeting the aquatic life designated use (i.e., this use is impaired). The pollutant listed as causing the impairment and requiring the development of a TMDL is pH, and the source is listed as unknown (*State of New Hampshire Final 2008 Section 303(d) Surface Water Quality List* (NHDES 2008)

A TMDL for pH for these segments of the Connecticut River is scheduled to be completed in the year 2019 (*State of New Hampshire Final 2008 Section 303(d) Surface Water Quality List* (NHDES 2008)). In the absence of a TMDL, EPA is required to use available information to establish water quality limits when issuing NPDES permits to facilities which discharge to impaired waters. See generally 40 CFR §122.44 (d). Effluent monitoring data submitted by the permittee from 2006-2008 do not indicate that the discharge of treated effluent from the Charlestown WWTP is contributing to this impairment (see **Appendix A**). The limitations and conditions in the draft permit were developed to ensure protection of all designated uses in the receiving water.

1. Reasonable Potential

In determining whether a discharge causes, has the reasonable potential to cause, or contributes to an excursion above a narrative or numeric criterion within a state water quality standard, EPA considers: (1) existing controls on point and non-point sources of pollution; (2) the variability of the pollutant or pollutant parameter in the effluent; (3) the sensitivity of the species to toxicity testing; (4) where appropriate, the dilution of the effluent in the receiving water; and (4) the statistical approach outlined in the *Technical Support Document for Water Quality-based Toxics Control, Section 3* (USEPA, March 1991 [EPA/505/2-90-001])(see also 40 CFR § 122.44(d)(1)(ii)). In accordance with New Hampshire's Water Quality Standards (RSA 485-A:8 VI, Env-Wq 1705.02), the available dilution for rivers and streams is based on a known or estimated value of the lowest average flow which occurs for seven (7) consecutive days with a recurrence interval of once in ten (10) years (7Q10 flow) for aquatic life and human health criteria for non-carcinogens, or the long-term harmonic mean flow for human health (for carcinogens only) in the receiving water. Furthermore, ten percent of the receiving water's assimilative capacity is held in reserve for future needs in accordance with New Hampshire's Surface Water Quality Regulations (Env-Wq 1705.01).

2. Anti-backsliding

Section 402(o) of the CWA generally provides that the effluent limitations of a renewed, reissued, or modified permit must be at least as stringent as the comparable effluent limitations in the previous permit. EPA has also promulgated anti-backsliding requirements which are found at 40 CFR § 122.44(l). Unless applicable anti-backsliding requirements are met, the limits and conditions in the reissued permit must be at least as stringent as those in the previous permit. The limitations and conditions contained within the draft permit satisfy antibacksliding requirements.

3. State Certification

Section 401(a)(1) of the CWA requires that all NPDES permit applicants obtain a certification from the appropriate state agency stating that the permit will comply with all applicable federal effluent limitations and state water quality standards. See CWA § 401(a)(1). The regulatory provisions pertaining to state certification provide that EPA may not issue a permit until a certification is granted or waived by the state in which the discharge originates (40 CFR § 124.53(a)). The regulations further provide that, "when certification is required…no final permit shall be issued…unless the final permit incorporated the requirements specified in the certification under § 124.53(e)" (40 CFR § 124.55(a)(2)).

C. Design Flow

The Charlestown WWTP has a design flow of 1.1 MGD, which was used in the calculation of the available dilution as well as the effluent limitations for total residual chlorine, whole effluent toxicity, and the mass-based limits for BOD_5 and TSS, in accordance with the requirements found at 40 CFR § 122.45(b).

The draft permit maintains the requirement in the current permit for the permittee to submit to EPA and NHDES a projection of loadings, a program for maintaining satisfactory treatment levels, and plans for facility improvements whenever the effluent flow exceeds 80 percent of the facility's design flow capacity for three consecutive months. The draft permit also maintains the average monthly and maximum daily flow reporting requirements found in the current permit.

D. Conventional pollutants

1. *Five-Day Biochemical Oxygen Demand (BOD_5) and Total Suspended Solids (TSS)*

The draft permit contains average monthly and average weekly effluent limitations for BOD_5 and TSS of 30 mg/l and 45 mg/l, respectively. These limitations are based on the secondary treatment regulations for POTWs found at 40 CFR § 133.102(a) and (b). The maximum daily limitations for BOD_5 and TSS of 50 mg/l in the current permit, which were based on state certification requirements, have been maintained in the draft permit.

The draft permit also contains average monthly (275 lbs/day), average weekly (413 lbs/day), and maximum daily (459 lbs/day) mass limits for BOD_5 and TSS, in accordance with the requirements of 40 CFR 122.45(f) (see **Appendix E).** The once-per-week monitoring frequency for BOD_5 and TSS in the current permit has been maintained in the draft.

The concentration and mass limitations for BOD_5 and TSS in the draft permit are the same as those in the current permit and are consistent with antibacksliding requirements.

In accordance with the provisions of 40 CFR § 133.102(a)(4)(iii), the draft permit requires that the 30-day average percent removal of BOD_5 and TSS be no less than 85%.

Effluent monitoring data submitted by the permittee from 2006-2008 show that the concentration and mass limitations for BOD_5 and TSS in the current permit have been consistently met (see **Appendix A**).

2. *pH*

The limitations for pH in the draft permit are based upon state certification requirements and the state's statutes found at RSA 485-A:8 II, requiring that "The pH range for said (Class B) waters shall be 6.5-8.0 except when due to natural causes." The pH limitations in the draft permit (6.5-8.0 Standard Units (SU)) are the same as those in the current permit and so are consistent with antibacksliding requirements, and are at least as stringent as the requirements of 40 CFR § 133.102(c). The permittee shall continue to monitor the pH of the effluent once per day.

The special condition in Part I.E. of the current permit, which allows for a change in the pH limitation when certain conditions are met (i.e., such a change would be considered if the permittee demonstrates to the satisfaction of the NHDES-WD that the instream water quality standard for pH would be protected when the discharge is outside the permitted range), has been maintained in the draft permit. Therefore, Part I.E.2. of the draft permit contains a provision which would allow EPA to modify the pH limits using a certified letter approach in the event NHDES-WD approves an adjustment of the pH limits. Such a change would only be allowed if it has been demonstrated that the revised pH limit range does not alter the naturally occurring pH of the receiving water. The pH limit range shall not be less restrictive than 6.0-9.0 SU, which is the pH limit range specified in the applicable National Effluent Limit Guidelines for POTWs (secondary treatment standards) found at 40 CFR Part 133.

Effluent monitoring data submitted by the permittee from 2006 – 2008 indicates that the pH of the effluent has consistently been within the range of 6.5 – 8.0 SU (see **Appendix A**). The limitations for pH in the draft permit are sufficiently stringent to ensure that the water quality criteria for pH will not be exceeded as a result of the discharge.

3. *Escherichia coli (E. coli)*

The *E. coli* limitations in the current permit have been maintained in the draft and so are consistent with antibacksliding requirements. The limitations for *E. coli* in the draft permit are a geometric monthly mean of 126 colony forming units per 100 milliliters (cfu/ml) and a maximum daily value of 406 cfu/100 ml. These limits are a state certification requirement and are based on the water quality standards for Class B waters (non-designated beach areas) found at RSA 485-A:8 II.

Effluent monitoring data submitted by the permittee from 2006 – 2008 show that both the average monthly and maximum daily discharges of *E. coli* have consistently been less than the limits in the current permit (see **Appendix A**). As a result, the monitoring frequency for *E. coli* in the draft permit has been reduced from three times per week, as required by the current permit, to twice per week. This reduction in sampling frequency is consistent with the suggested effluent monitoring frequency found in the *EPA/NHDES-WD Effluent Monitoring Guidance* document (EPA/NHDES 1999), which establishes recommended minimum monitoring frequencies for various parameters based on the type(s) of treatment technology(ies) employed by a facility.

E. Available Dilution, Non-conventional and Toxic Pollutants

Water quality-based effluent limitations for specific toxic pollutants are based on numeric chemical-specific criteria derived from extensive scientific studies. The EPA has summarized and published toxicity criteria for specific toxic pollutants in the *Quality Criteria for Water* (USEPA 1986 [EPA440/5-86-001]), commonly referred to as the "Gold Book". The Gold Book includes acute aquatic life criteria (to protect against the effects of short-term exposure, such as death) and chronic aquatic life criteria (to protect against the effects of long-term exposure, such as impaired growth). The State of New Hampshire adopted the Gold Book criteria (with certain exceptions) into the State's Surface Water Quality Regulations which were readopted effective May 21, 2008.. EPA uses the pollutant-specific criteria contained within the state standards along with the available dilution in the receiving water in the development of water quality-based effluent limitations.

1. Available Dilution

Water quality-based effluent limitations are established using a calculated dilution factor that represents the available dilution in the receiving water at the point of discharge. The dilution factor is derived from the design flow of the facility and the annual seven consecutive day mean low flow with a recurrence interval of once in every ten years (the 7Q10 flow) in the receiving water (see Env-Wq 1702.44). The available dilution is reduced by 10% to account for the state's assimilative capacity reserve rule (see Env-Wq 1705.01).

A dilution factor of 535 was used to develop the effluent limits in the current permit. This value was based upon an estimate of the 7Q10 flow in the receiving water at the point of discharge derived from flow data collected by a United States Geological Survey (USGS) flow gage in the Connecticut River (USGS gage No. 01154500, Connecticut River at North Walpole), which is located approximately eight river miles downstream from the discharge, from 1942-1992 and a corresponding 7Q10 flow value at the gage of 1,039 cfs.

In developing the draft permit, the 7Q10 flow in the receiving water was updated to account for any changes in flow that may have occurred since the development of the current permit, particularly since flow regulation in the Connecticut River was significantly different prior to 1974. Therefore, flow data from USGS gage No. 01154500 (Connecticut River at North Walpole) collected from 1974-2006 was used to estimate the

7Q10 flow in the receiving water at the point of discharge. This period of record was selected because it more closely represents current flow conditions. An updated 7Q10 flow at USGS gage No. 01154500 for the period of record 1974-2006 was determined to be 1,387 cfs, which is an increase from the 7Q10 flow at the gage of 1,039 cfs (period of record 1942-1992) used in the calculation of the dilution factor in the current permit. Additionally, flow data collected by a USGS gage located on the Williams River (USGS Gage No. 01153550, Williams River near Rockingham, VT), which flows into the Connecticut River in the intervening area between the Charlestown WWTP and the Connecticut River gage, was used in recalculating the 7Q10 flow in the Connecticut River at the point of discharge. The 7Q10 flows at the USGS gages in the Connecticut and Williams Rivers and the drainage areas contributing flow to the gages and to the areas between the Charlestown WWTP and USGS gage No. 01154500 (North Walpole) and between USGS gage No. 01153550 (Rockingham, VT) and the Williams River's confluence with the Connecticut River, were used to determine the proportional flows in both rivers. The proportional flows were then used to derive a 7Q10 flow value of 1371.17 cfs in the Connecticut River at the Charlestown WWTP (see **Appendix E**).

Accounting for the 7Q10 flow at the point of discharge, the design flow of the facility, and the required 10 % reserve capacity in the receiving water, a dilution factor of 725.2 was calculated (see **Appendix E** for calculations).

2. Total Residual Chlorine (TRC)

The acute and chronic aquatic life criteria for total residual chlorine specified in the New Hampshire water quality standards are 19 µg/l and 11 µg/l, respectively (see Env-Wq. 1703.21, Table 1703.1).

In order to ensure that the acute and chronic criteria are met in the receiving water, the maximum daily and average monthly concentrations of total residual chlorine in the discharge must not exceed 13779 µg/l and 7977 µg/l, respectively. These values were determined by multiplying the dilution factor by the criteria, as shown below.

TRC_{Acute} = 19 µg/l * 725.2 = 13779 µg/l (1.4 mg/l)

$TRC_{Chronic}$ = 11 µg/l * 725.2 = 7977 µg/l (8.0 mg/l)

The average monthly and maximum daily limitations for total residual chlorine of 1.0 mg/l in the current have been maintained in the draft permit. These limitations, which are more stringent than the limits calculated above, are based upon best professional judgment (BPJ), as allowed by CWA Section 402(a)(1) and 40 CFR § 125.3 The limits in the draft permit are consistent with antibacksliding requirements.

3. Nitrogen

In December 2000, the Connecticut Department of Environmental Protection (CT DEP) completed a Total Maximum Daily Load (TMDL) for addressing nitrogen-driven

eutrophication impacts in Long Island Sound. The TMDL included a Waste Load Allocation (WLA) for point sources and a Load Allocation (LA) for non-point sources. The point source WLA for out-of-basin sources (Massachusetts, New Hampshire and Vermont wastewater facilities discharging to the Connecticut, Housatonic and Thames River watersheds) requires an aggregate 25 % reduction from the baseline total nitrogen loading estimated in the TMDL.

The baseline total nitrogen point source loadings estimated for the Connecticut, Housatonic, and Thames River watersheds were 21,672 lbs/day, 3,286 lbs/day, and 1,253 lbs/day respectively (see table below). The estimated current point source total nitrogen loadings for the Connecticut, Housatonic, and Thames, Rivers, respectively are 13,836 lbs/day, 2,151 lbs/day, and 1,015 lbs/day, based on recent information and including all POTWs in the watershed. The following table summarizes the estimated baseline loadings, TMDL target loadings, and estimated current loadings:

Basin	**Baseline Loading[1] lbs/day**	**TMDL Target[2] lbs/day**	**Current Loading[3] lbs/day**
Connecticut River	21,672	16,254	13,836
Housatonic River	3,286	2,464	2,151
Thames River	1,253	939	1,015
Totals	**26,211**	**19,657**	**17,002**

1. Estimated loading from TMDL, (see Appendix 3 to CT DEP "Report on Nitrogen Loads to Long Island Sound", April 1998)
2. Reduction of 25% from baseline loading
3. Estimated current loading from 2004 – 2005 DMR data – detailed summary attached as **Appendix D**.

The TMDL target of a 25 % aggregate reduction from baseline loadings is currently being met, and the overall loading from MA, NH and VT wastewater treatment plants discharging to the Connecticut River watershed has been reduced by about 36 %.

In order to ensure that the aggregate nitrogen loading from out-of-basin point sources does not exceed the TMDL target of a 25 percent reduction over baseline loadings, EPA intends to include a permit condition for all existing treatment facilities in Massachusetts and New Hampshire that discharge to the Connecticut, Housatonic and Thames River watersheds, requiring the permittees to evaluate alternative methods of operating their treatment plants to optimize the removal of nitrogen, and to describe previous and ongoing optimization efforts. Facilities not currently engaged in optimization efforts will also be required to implement optimization measures sufficient to ensure that their nitrogen loads do not increase, and that the aggregate 25 % reduction is maintained. Such a requirement has been included in this permit. EPA also intends to work with the State of Vermont to ensure that similar requirements are included in its discharge permits.

Specifically, the permit requires an evaluation of alternative methods of operating the existing wastewater treatment facility in order to control total nitrogen levels, including, but not limited to, operational changes designed to enhance nitrification (seasonal or year-round), incorporation of anoxic zones, septage receiving policies and procedures, and side

stream management. This evaluation is required to be completed and submitted to EPA and the NHDES **within one year of the effective date** of the permit, along with a description of past and ongoing optimization efforts. The permit also requires implementation of optimization methods sufficient to ensure that there is no increase in total nitrogen compared to the existing average daily load. The annual average total nitrogen load from this facility (2004 – 2005) is estimated to be 60 lbs/day (see **Appendix D**). The permit requires annual reports to be submitted that summarize progress and activities related to optimizing nitrogen removal efficiencies, document the annual nitrogen discharge load from the facility, and track trends relative to previous years. The draft permit includes a requirement for the facility to be operated in such a way that discharges of total nitrogen are minimized. The draft permit also includes average monthly and maximum daily reporting requirements for total nitrogen (TN), ammonia nitrogen, total Kjeldahl nitrogen (TKN), total nitrite nitrogen (NO_2), and total nitrate nitrogen (NO_3).

The agencies will annually update the estimate of all out-of-basin nitrogen loads and may incorporate total nitrogen limits in future permit modifications or reissuances as may be necessary to address increases in discharge loads, a revised TMDL, or other new information that may warrant the incorporation of numeric permit limits. There have been significant efforts by the New England Interstate Water Pollution Control Commission (NEIWPCC) work group and others since completion of the 2000 TMDL, which are anticipated to result in revised wasteload allocations for in-basin and out-of-basin facilities. Although not a permit requirement, it is recommended that any facilities planning that might be conducted for this facility should consider alternatives for further enhancing nitrogen reduction.

4. Whole Effluent Toxicity (WET)

EPA's *Technical Support Document for Water Quality Based Toxics Control* (USEPA 1991 [EPA/505/290-001]) recommends using an "integrated strategy" containing both pollutant (chemical) specific approaches and whole effluent (biological) toxicity approaches to control toxic pollutants in effluent discharges from entering the nation's waterways. EPA-Region I adopted this "integrated strategy" on July 1, 1991, for use in permit development and issuance. These approaches are designed to protect both aquatic life and human health. Pollutant-specific approaches such as those found in the Gold Book and state regulations address individual chemicals, whereas whole effluent toxicity (WET) approaches evaluate interactions between pollutants, thus rendering an "overall" or "aggregate" toxicity assessment of the effluent. Furthermore, WET measures the "additive" and/or "antagonistic" effects of individual chemical pollutants, which pollutant-specific approaches do not; thus, the need for both approaches. In addition, the presence of an unknown toxic pollutant can be discovered and addressed through this process.

Section 101(a)(3) of the CWA specifically prohibits the discharge of toxic pollutants in toxic amounts and New Hampshire law states that, "all waters shall be free from toxic substances or chemical constituents in concentrations or combination that injure or are inimical to plants, animals, humans, or aquatic life; ...." (NH RSA 485-A:8, VI and NH

Code of Administrative Rules, Part Env-Wq 1703.21). The federal NPDES regulations found at 40 CFR §122.44(d)(1)(v) require whole effluent toxicity limits in a permit when reasonable potential exists for a discharge to cause or contribute to an excursion above state narrative criteria for toxicity. Furthermore, the results of toxicity tests may be used to demonstrate compliance with the "no toxics in toxics amounts" requirement found in both the CWA and in the State of New Hampshire's regulations.

The current policy of EPA-Region I is to require toxicity testing in all NPDES permits issued to POTWs. The type of whole effluent toxicity test(s) (acute and/or chronic) and the effluent limitation(s) required by the permit are based on the available dilution in the receiving water at the point of discharge. NPDES permits issued to municipal dischargers (i.e., POTWs) having a dilution factor greater than 100 (as is the case with the Charlestown WWTP) typically include an acute (LC_{50}) WET limit and require that WET tests be conducted using the daphnid, *Ceriodaphnia dubia* (*C. dubia*) and the fathead minnow, *Pimephales promelas* (*P. promelas*) as the test organisms. The acute limit (LC_{50}) is the percentage of effluent in a sample that must not cause more than a 50 % mortality rate in the test organisms. The current permit includes an LC_{50} limit of ≥ 50 %. An LC_{50} limit of ≥ 50 % means that a sample comprised of 50 % effluent shall not cause mortality to more than 50 % of the test organisms. Under the current permit, the permittee conducts WET testing twice per year, by the end of the calendar quarters ending June 30th and September 30th.

WET test data submitted by the permittee from 2006-2008 indicate that the facility has consistently met the acute WET limit in the current permit (see **Appendix B**). Taking the re-calculated dilution factor of 725.2 into consideration, the LC_{50} limit in the current permit (≥ 50 %) has been maintained in the draft permit.

A special condition is included in the current permit whereby the WET testing requirements may be reduced. Specifically, Part E of the current permit allows for a reduction in the frequency of the required WET tests to not less than once per year, following the completion of a minimum of the most recent four successive toxicity tests of the effluent, all of which must be valid tests and demonstrate compliance with the permit limits for WET. In accordance with this condition, the permittee submitted a written request to EPA for the review of the appropriate WET test results and a subsequent reduction in the testing frequency.

EPA evaluated the results of the WET tests conducted during the calendar quarters ending June 30th and September 30th of 2007 and 2008, and concluded that these four tests were valid toxicity tests and that the appropriate LC_{50} values were computed and reported correctly. Therefore, these toxicity tests demonstrate that the criteria for reducing the WET testing requirements in the current permit have been met. The frequency of WET testing in the draft permit has been reduced to once per year (from twice per year in the current permit). Acute WET tests shall be conducted once per year, by the end of the calendar quarter ending June 30th, using the fathead minnow, *Pimephales promelas* (*P. promelas*), and the daphnid, *Ceriodaphnia dubia* (*C. dubia*), as test organisms.

Additional Analyses

The current permit includes a requirement for the reporting of several selected parameters, the results of which are determined through analyses conducted on samples of the 100 percent effluent sample in conjunction with WET tests. Specifically, the current permit includes analysis and reporting requirements for hardness, ammonia nitrogen as nitrogen, aluminum; and total recoverable cadmium, chromium, copper, nickel, lead and zinc.

Certain metals that may be present in the effluent discharged from POTWs can be toxic to aquatic life. Acute and chronic freshwater criteria for these metals are shown in **Appendix F** (also see the New Hampshire Water Quality Standards at Env-Wq 1703.21, Table 1703.1). The maximum allowable concentrations of these metals that can be present in the discharge (i.e., effluent limits) are also shown in **Appendix F**. The results of metals analyses conducted on samples of the effluent in conjunction with WET tests from 2006-2008 are shown in **Appendix C**. These results indicate that there is no reasonable potential for the discharge to cause or contribute to an excursion above water quality criteria for aluminum, zinc, nickel, cadmium and chromium, lead, or copper, as the concentrations of these metals in the effluent were well below the maximum allowable concentrations that may be present in the discharge (see **Appendix F**). Therefore, effluent limitations for these metals are not proposed in the draft permit. The monitoring requirements in the current permit for these metals, as well as for hardness and ammonia nitrogen as nitrogen have been maintained in the draft permit.

If toxicity persists in the effluent, the monitoring frequency and testing requirements may be increased. The permit may also be modified, or alternatively revoked and reissued, to incorporate additional toxicity testing requirements or chemical specific limits. These actions will occur if the Regional Administrator determines the NH standards are not adequately enforced and users of the receiving water are not adequately protected during the remaining life of the permit. Results of these toxicity tests are considered "new information not available at the permit development"; therefore, the permitting authority is allowed to use said information to modify an issued permit under the authority in 40 CFR §122.62(a)(2).

VI. SLUDGE

Section 405(d) of the Clean Water Act (CWA) requires that EPA develop technical standards regulating the use and disposal of sewage sludge. These regulations were signed on November 25, 1992, published in the Federal Register on February 19, 1993, and became effective on March 22, 1993. Domestic sludge which is land applied, disposed in a surface disposal unit, or fired in a sewage sludge incinerator is subject to federal Part 503 technical and to State Env-Wq 800 standards. Part 503 regulations have a self-implementing provision; however, the CWA requires implementation through permits. Domestic sludge which is disposed of in municipal solid waste landfills are in compliance with Part 503 regulations provided the sludge meets the quality criteria of the landfill and the landfill meets the requirements of 40 CFR Part 258.

The draft permit has been conditioned to ensure that sewage sludge use and disposal practices meet the CWA Section 405(d) Technical Standards. In addition, EPA Region I has included with the draft permit a 72-page document entitled *EPA Region I NPDES Permit Sludge Compliance Guidance* (EPA-Region I November 1999) (see **Attachment B** of the draft permit) for use by the permittee in determining the appropriate sludge conditions for the chosen method of sewage sludge use or disposal practices.

The permittee is required to submit an annual report to EPA and NHDES-WD by **February 19th** of each year, containing the information specified in the Sludge Compliance Guidance Document attached to the draft permit for the permittee's chosen method of sludge disposal.

VII. INDUSTRIAL USERS

The permittee is presently not required to administer a pretreatment program based on the authority granted under 40 CFR §122.44(j), 40 CFR §403 and Section 307 of the CWA. However, the draft permit contains conditions that are necessary to allow EPA and the State of New Hampshire to ensure that pollutants from industrial users will not pass through the facility and cause violations of water quality standards in the receiving water, sludge use and disposal difficulties or cause interference with the operation of the treatment facility. The permittee is required to notify EPA and the State of New Hampshire whenever a process wastewater discharge to the facility from a primary industrial category is planned, (see 40 CFR §122 Appendix A for list) or if there is any substantial change in the volume or character of pollutants being discharged into the facility by a source that was discharging at the time of issuance of the permit. The permit also requires the permittee to: (1) report to EPA and NHDES the name(s) of all Industrial Users subject to Categorical Pretreatment Standards under 40 CFR §403.6 and 40 CFR Chapter I, Subchapter N (Parts 405-415, 417-436, 439-440, 443, 446-447, 454-455, 457-461, 463-469, and 471 as amended) who commence discharge to the POTW after the effective date of the permit, and (2) submit to EPA and NHDES copies of Baseline Monitoring Reports and other pretreatment reports submitted by industrial users.

VIII. OPERATION AND MAINTENANCE

Regulations regarding proper operation and maintenance are found at 40 CFR § 122.41(e). These regulations require, "that the permittee shall at all times operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of the permit." The treatment plant and the collection system are included in the definition of "facilities and systems of treatment and control" and are therefore subject to the proper operation and maintenance requirements of 40 CFR § 122.41(e).

Similarly, a permittee has a "duty to mitigate" pursuant to 40 CFR § 122.41(d), which requires the permittee to "take all reasonable steps to minimize or prevent any discharge in violation of the permit which has a reasonable likelihood of adversely affecting human health or the environment."

General requirements for proper operation and maintenance and mitigation have been included in Part II of the draft permit. Specific permit conditions have also been included in Parts I.B, C, and D. of the draft permit. These requirements include mapping of the wastewater collection system, reporting of unauthorized discharges (including sanitary sewer overflows (SSOs)), maintaining an adequate maintenance staff, performing preventative maintenance, controlling inflow and infiltration (I/I) to the extent necessary to prevent SSOs and I/I-related effluent violations at the wastewater treatment plant, and for maintaining alternate power where necessary.

IX. ESSENTIAL FISH HABITAT

Under the 1996 Amendments (PL 104-267) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq. (1998)), EPA is required to consult with the National Marine Fisheries Services (NMFS) if EPA's action or proposed actions that it funds, permits, or undertakes, may adversely impact any essential fish habitat (16 U.S.C. § 1802(10)).

The Amendments broadly define "essential fish habitat" (EFH) as: waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. § 1802(10)). "Adverse impact" means any impact which reduces the quality and/or quantity of EFH (50 CFR § 600.910(a)). Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences or actions.

Essential fish habitat is only designated for species for which federal fisheries management plans exist (16 U.S.C. § 1855(b)(a)(A)). EFH designations for New England were approved by the U.S. Department of Commerce on March 3, 1999.

The Atlantic salmon (*Salmo salar)* is the only managed species believed to be present during one or more life stages in the area where the Charlestown WWTF discharge outfall is located (in the Connecticut River).

EPA has determined that the draft permit has been conditioned in such a way so as to minimize any adverse impacts on Atlantic salmon EFH for the following reasons:

- This permit action is a reissuance of an existing NPDES permit.
- The discharge has a very large dilution factor, calculated at 725.2, using the 7Q10 river flow of the Connecticut River.
- EPA's evaluation indicates that there is no reasonable potential for the discharge to cause or contribute to an excursion above water quality criteria for aluminum, zinc, nickel, cadmium, chromium, lead, or copper, as the concentrations of these metals in the effluent were well below the maximum allowable concentrations that may be

present in the discharge. Acute Whole Effluent Toxicity tests shall be conducted once per year to document that the effluent meets water quality criteria and does not present toxicity problems.

- Chlorine presents a threat to this species. The average monthly and maximum daily limitations for total residual chlorine of 1.0 mg/l have been maintained in the draft permit. These water quality-based limits for chlorine are more stringent than those which would be necessary based on state water quality criteria.

- Excessive nutrients also present a threat to this species. There is a requirement for the facility to be operated in such a way that discharges of total nitrogen are minimized. The TMDL target of a 25 % aggregate reduction from baseline nitrogen loadings is currently being met in the Connecticut River, and the overall loading from MA, NH and VT wastewater treatment plants discharging to the watershed has been reduced by about 36%.

- The facility withdraws no water from the Connecticut River, so no life stage of the Atlantic salmon is vulnerable to impingement or entrainment from this facility.

- The draft permit prohibits the discharge from violating state water quality standards.

- The draft permit prohibits the discharge of pollutants or combination of pollutants in toxic amounts.

- The effluent limitations and conditions in the draft permit were developed to be protective of all aquatic life.

EPA believes that the conditions and limitations contained within the draft permit adequately protects all aquatic life, including those with designated EFH in the receiving water, and that further mitigation is not warranted. Should adverse impacts to EFH be detected as a result of this permit action, or if new information is received that changes the basis for EPA's conclusions, NMFS will be contacted and an EFH consultation will be re-initiated.

As the federal agency charged with authorizing the discharge from this facility, EPA has submitted the draft permit and fact sheet, along with a cover letter, to NMFS Habitat Division for their review.

X. ENDANGERED SPECIES ACT

Section 7(a) of the Endangered Species Act of 1973, as amended (ESA) grants authority to and imposes requirements upon Federal agencies regarding endangered or threatened species of fish, wildlife, or plants ("listed species") and habitat of such species that has been designated as critical (a "critical habitat"). The ESA requires every Federal agency, in

consultation with and with the assistance of the Secretary of Interior, to insure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The USFWS administers Section 7 consultations for freshwater species. The National Marine Fisheries Service (NMFS) administers Section 7 consultations for marine species and anadromous fish.

As the federal agency charged with authorizing the discharge from this facility, EPA has conducted a review in support of our consultation responsibilities under section 7 (a)(2) of the Endangered Species Act (ESA) for potential impacts to federally listed species. Based on the information available, EPA has determined that the dwarf wedgemussel (DWM) (*Alasmidonta heterodon*) may be present in the vicinity of the WWTP discharge.

Connecticut River DWM Population in New Hampshire

A discussion of any potential impacts on the DWM from the Charleston WWTP discharge is warranted due to the presence of the mussel in the Connecticut River mainstem in Sullivan County, NH, near Weathersfield Bow. The WWTP is located in Sullivan County, downstream of Weathersfield Bow. According to the USFWS:

> "The mainstem of the Connecticut River in New Hampshire and Vermont is considered to have the largest remaining DWM population, consisting of three distinct stretches of sporadically occupied habitat segmented by hydroelectric dams. It is estimated that there are hundreds of thousands of DWM scattered within an approximate 75-mile stretch of the Connecticut River." (Dwarf Wedgemussel 5 year Review New England Field Office, USFWS Concord, NH, July 2007).

DWM Stressors

In the 1993 DWM Recovery Plan, the USFWS identified the main factors responsible for the decline of the dwarf wedgemussel. Two of these factors, impoundments and riverbank alteration, are not associated with the permit renewal of the WWTP discharge. A third factor, siltation, is not expected to be caused in this case by the physical movement of water from the discharge into the Connecticut River. The outfall meets the river three feet below the surface and does not have the necessary volume or velocity to cause bank erosion or bottom scouring of the river. Therefore, this NPDES discharge is not thought to contribute to downstream siltation. The fourth factor, the potential for water pollution from the discharge to cause stress to the DWM, shall be examined to evaluate the potential impact of the discharge to the DWM or the fish that host the DWM larvae (known as glochidia). Host fish in New Hampshire are known to include the slimy sculpin (*C. congatus)* and juvenile and parr of the Atlantic salmon *(Salmo salar)* (Wicklow, New Hampshire Wildlife Action Plan 2005).

EPA has determined that the operation of this facility, as governed by the permit action, is not likely to adverse affect the DWM or the fish that host the glochidia. The following

factors have been identified which are expected to minimize any adverse impacts to the DWM:

- This permit action is a reissuance of an existing NPDES permit.

- The discharge has a very large dilution factor, calculated at 725.2, using the 7Q10 river flow of the Connecticut River. The water discharged is considered to be buoyant. No direct contact of the discharge water with benthic organisms is likely.

- The DWM is sensitive to elevated concentrations of potassium, zinc, copper, cadmium and other elements. (USFWS Fact Sheet, December 2005) EPA's evaluation indicates that there is no reasonable potential for the discharge to cause or contribute to an excursion above water quality criteria for aluminum, zinc, nickel, cadmium, chromium, lead, or copper, as the concentrations of these metals in the effluent were well below the maximum allowable concentrations that may be present in the discharge. Acute Whole Effluent Toxicity tests shall be conducted once per year to document that the effluent meets water quality criteria and does not present toxicity problems.

- Chlorine presents a threat to this species. The average monthly and maximum daily limitations for total residual chlorine of 1.0 mg/l have been maintained in the draft permit. These water quality-based limits for chlorine are more stringent than those which would be necessary based on state water quality criteria.

- Excessive nutrients also present a threat to this species. There is a requirement for the facility to be operated in such a way that discharges of total nitrogen are minimized. The TMDL target of a 25 % aggregate reduction from baseline nitrogen loadings is currently being met in the Connecticut River, and the overall loading from MA, NH and VT wastewater treatment plants discharging to the watershed has been reduced by about 36%.

- The facility withdraws no water from the Connecticut River, so no life stage of the DWM or the host fish are vulnerable to impingement or entrainment from this facility.

- The draft permit prohibits the discharge from violating state water quality standards.

- The draft permit prohibits the discharge of pollutants or combination of pollutants in toxic amounts.

- The effluent limitations and conditions in the draft permit were developed to be protective of all aquatic life.

EPA Finding

Based on the relevant information examined, EPA finds that the renewal of the Charlestown WWTP NPDES permit is not likely to adversely affect the dwarf wedgemussel or its habitat. EPA is coordinating a review of and is requesting concurrence on this finding with the USFWS through the Draft Permit, Fact Sheet, and an interagency letter.

If adverse effects do occur as a result of this permit action, or if new information becomes available that changes the basis for this determination, EPA will notify USFWS and initiate consultation.

XI. ANTIDEGRADATION

The New Hampshire water quality standards include an antidegradation provision which states that the existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected (Env-Wq 1708).

The draft permit contains limitations and conditions which are at least as stringent as those contained in the existing permit. The State of New Hampshire has indicated that there will be no lowering of water quality and no loss of existing designated uses in the receiving water as a result of this permit action, and that additional antidegradation review is not warranted at this time.

XII. STATE CERTIFICATION REQUIREMENTS

EPA may not issue a permit unless the state water pollution control agency with jurisdiction over the receiving water(s) in which the discharge originates either certifies that the effluent limitations and/or conditions contained in the permit are stringent enough to assure, among other things, that the discharge will not cause the receiving water to violate state water quality standards or the agency waives its right to certify as set forth in 40 CFR § 124.53. The NHDES is the certifying authority within the State of New Hampshire.

The staff of the NHDES-WD, Surface Water Quality Bureau, has reviewed the draft permit and advised EPA-Region I that the limitations are adequate to protect water quality. EPA-Region I has requested permit certification by the state and expects that the draft permit will be certified. Regulations governing state certification are set forth in 40 CFR §§124.53 and §124.55.

XIII. COMMENT PERIOD, REQUESTS FOR PUBLIC HEARINGS AND PROCEDURES FOR FINAL DECISION

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period to:

Meridith Timony
U.S. Environmental Protection Agency
5 Post Office Square - Suite 100 (OEP06-1)
Boston, Massachusetts 02109-3912
Telephone: (617) 918-1533; Fax: (617) 918-1505

Any person, prior to such date, may submit a request in writing for a public hearing to consider the draft permit to EPA and the State Agency. Such requests shall state the nature of the issue proposed to be raised at the hearing. A public hearing may be held after at least thirty (30) days public notice whenever the Regional Administrator finds that response to this notice indicates significant public interest. In reaching a final decision on the draft permit, the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston office.

Following the close of the comment period, and after a public hearing (if applicable), the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice.

Information concerning the draft permit may be obtained between the hours of 9:00 am and 5:00 pm, excluding holidays.

February 6, 2010

Date:

Stephen Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

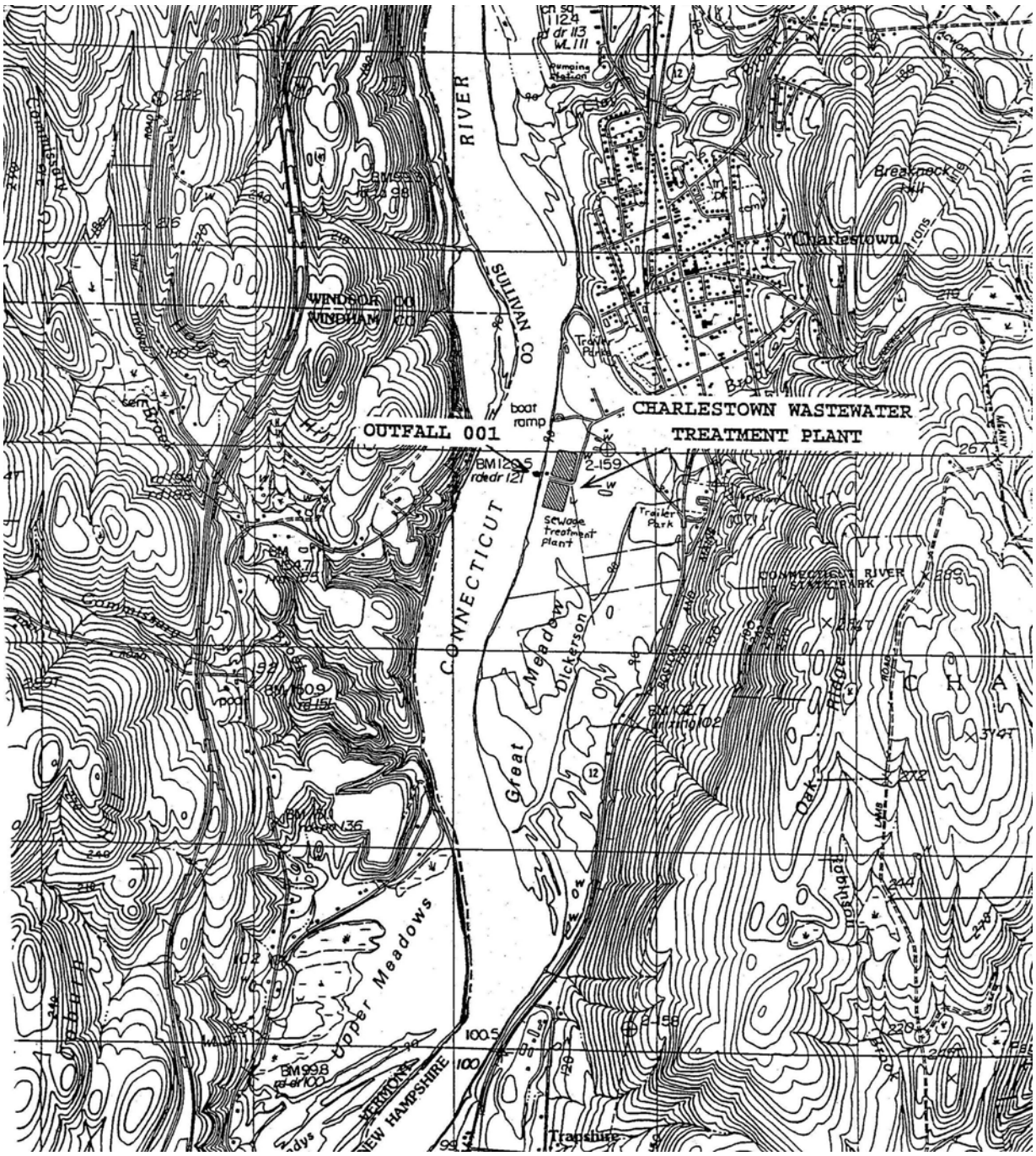

Figure 1 Charlestown WWTP and Outfall 001

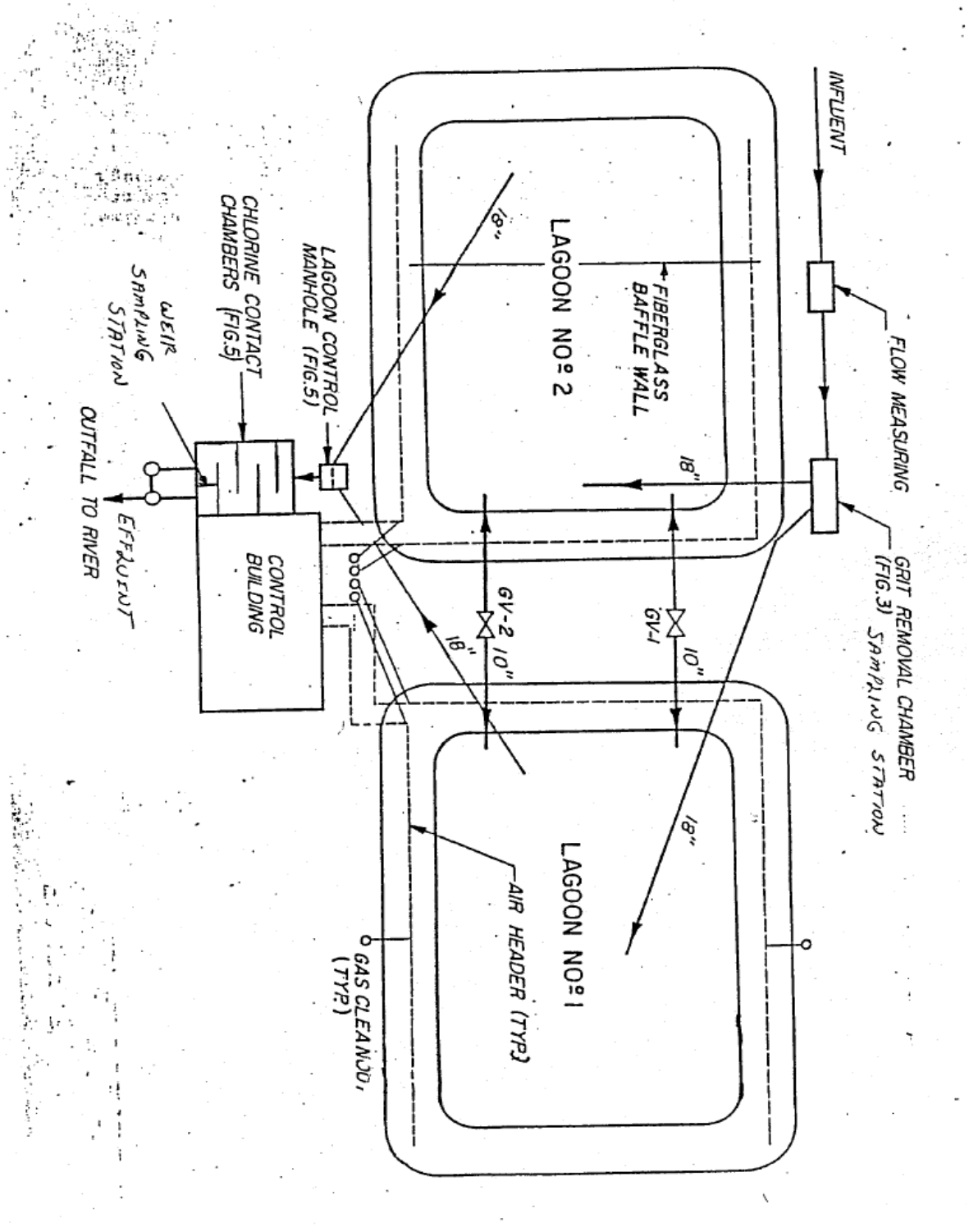

Figure 2 Charlestown WWTP Process Flow Diagram

Appendix A

Conventional Pollutants (2006-2008)

Date	Flow		BOD_5 (mg/l)			BOD_5 (lbs/day)			TSS (mg/l)			TSS (lbs/day)			pH (SU)		*E. coli* (cfu/100 ml)	
	Avg.Monthly	Max.Daily	Avg.Monthly	Avg.Weekly	Max.Daily	Avg.Monthly	Avg.Weekly	Max.Daily	Avg.Monthly	Avg.Weekly	Max.Daily	Avg.Monthly	Avg.Weekly	Max.Daily	Minimum	Maximum	Avg.Monthly	Max.Daily
Existing Limits	**Report**	**Report**	**30**	**45**	**50**	**275**	**413**	**459**	**30**	**45**	**50**	**275**	**413**	**459**	**6.5**	**8.3**	**126**	**406**
Jan. 2006	0.466	0.843	8	11	11	27.5	34.5	34.5	4	5	5	13.6	34.5	24	7.01	7.16	3.02	3
Feb. 2006	0.502	0.726	6.5	7	7	25.4	38.6	38.6	2.5	3	3	11.4	38.6	19.5	7.08	7.15	3.02	3
March 2006	0.391	0.734	6.6	7	7	17.7	24.9	24.9	2.3	3	3	6.4	24.9	10.6	7.04	7.3	3.02	3
April 2006	0.443	0.757	13.5	20	20	38.4	49.5	49.5	12.5	20	20	34.5	49.5	49.5	7.13	7.32	3.02	3
May 2006	0.497	0.943	3	3	3	12.5	20.2	20.2	6.3	7	7	23.7	20.2	46.5	7.14	7.26	3.02	3
June 2006	0.374	0.709	4.7	5	5	16.3	23.7	23.7	2.3	3	3	9.3	23.7	17.7	7.04	7.23	3.02	3
July 2006	0.393	0.761	4.3	6	6	13	19	19	2	2	2	6.7	19	12.7	7.08	7.41	3.02	3
Aug. 2006	0.228	0.649	3	3	3	8.75	15.7	15.7	2	2	2	5.85	15.7	10.5	7.14	7.3	4.48	10
Sept. 2006	0.417	0.563	3	3	3	9.2	10.7	10.7	2.5	3	3	17.4	10.7	38.4	7.01	7.41	3.02	3
Oct. 2006	0.413	0.61	5.5	8	8	26.5	41	41	2	2	2	9.1	41	10.2	6.94	7.2	3.02	3
Nov. 2006	0.369	0.642	5	7	7	10.9	17.6	17.6	3	5	5	6.8	17.6	10.7	7.04	7.48	3.02	3
Dec. 2006	0.224	0.56	5	5	5	10.5	20.5	20.5	2	2	2	4.2	20.5	8.2	7.08	7.29	3.02	3
Jan. 2007	0.423	0.668	5.3	7	7	17.3	26.4	26.4	3.3	5	5	13.3	26.4	27.9	7.04	7.28	3.02	3
Feb. 2007	0.269	0.584	6.5	7	7	12	14.9	14.9	2.5	3	3	4.4	14.9	4.5	7.04	7.22	3.02	3
March 2007	0.268	0.51	5	6	6	11.3	13.4	13.4	2.3	3	3	5.8	13.4	9.5	6.76	7.12	3.02	3

Appendix A

Charlestown WWTP – Conventional Pollutants (2006-2008)

Date	Flow		BOD_5 (mg/l)			BOD_5 (lbs/day)			TSS (mg/l)			TSS (lbs/day)			pH (SU)		*E. coli* (cfu/100 ml)	
	Avg.Monthly	Max.Daily	Avg.Monthly	Avg.Weekly	Max.Daily	Avg.Monthly	Avg.Weekly	Max.Daily	Avg.Monthly	Avg.Weekly	Max.Daily	Avg.Monthly	Avg.Weekly	Max.Daily	Minimum	Maximum	Avg.Monthly	Max.Daily
Existing Limits	**Report**	**Report**	**30**	**45**	**50**	**275**	**413**	**459**	**30**	**45**	**50**	**275**	**413**	**459**	**6.5**	**8.0**	**126**	**406**
April 2007	0.319	0.548	4	5	5	10.5	12.9	12.9	3.3	6	6	12.1	12.9	27.4	6.89	7.05	3.02	3
May 2007	0.373	0.759	2.7	3	3	7.7	9.3	9.3	2	2	2	6.2	9.3	9.3	6.96	7.28	3.09	4
June 2007	0.307	0.652	3.7	5	5	8.3	12.9	12.9	2	2	2	4.8	12.9	8.4	7.18	7.5	3	3
July 2007	0.329	0.611	3	3	3	10.1	11.2	11.2	2	2	2	6.75	11.2	7.5	7.2	7.37	3	3
Aug. 2007	0.245	0.652	3	3	3	3.67	4.58	4.58	2	2	2	2.44	4.58	3.05	7.12	7.21	1	1
Sept. 2007	0.227	0.423	3	3	3	6.2	6.5	6.5	3.5	5	5	7.1	6.5	9.8	6.82	7.14	1	1
Oct. 2007	0.294	0.567	3	3	3	8	11.1	11.1	2	2	2	5.4	11.1	7.4	6.71	7.14	1	1
Nov. 2007	0.246	0.482	0	0	0	9.1	11.7	11.7	0	0	0	6.1	11.7	7.8	6.81	7.2	1	1
Dec. 2007	0.204	0.482	4	4	4	6.4	8.9	8.9	0	2	2	0.95	8.9	1.9	7.1	7.42	1.12	2
Jan. 2008	0.428	0.641	4	7	7	18.3	32.3	32.3	2.5	4	4	11	32.3	18.5	6.66	7.14	1.23	2
Feb. 2008	0.495	0.97	4.3	5	5	15.8	16.1	16.1	3.7	4	5	13	16.1	12.8	6.87	7.06	6.02	23
March 2008	0.501	0.972	5.3	5.3	7	20.2	28.7	28.7	3.7	4	5	13.6	28.7	20.5	6.79	7.24	1.07	2
April 2008	0.405	0.923	3.7	5	5	13.9	27.9	27.9	5	8	8	15.2	27.9	20.7	6.99	7.21	1.07	2
May 2008	0.434	0.851	1.3	4	4	5.4	16.3	16.3	3.3	5	5	11.4	16.3	20.3	7.01	7.24	1	1
Min	0.204	0.423	0	0	0	3.67	4.58	4.58	0	0	0	0.95	4.58	1.9	6.66	7.05	1	1
Max	0.502	0.972	13.5	20	20	38.4	49.5	49.5	12.5	20	20	34.5	49.5	49.5	7.2	7.5	6.02	23
Avg.	0.362	0.682	4.48	5.53	5.59	13.82	20.03	20.03	2.90	3.81	3.89	9.70	20.03	16.10	6.99	7.25	2.62	3.57

Appendix B

Non-conventional Pollutants (2006-2008)

Date	Whole Effluent Toxicity	Whole Effluent Toxicity	Hardness (mg/l)	Ammonia Nitrogen (mg/l)
	LC_{50} (*C. dubia*)	LC_{50} (*P. promelas*)		Avg.Monthly
Existing Limits	**≥ 50%**	**≥ 50%**	**Report**	**Report**
March 2006			60	
June 2006	>100	>100	61	20
Sept. 2006	>100	>100	58	10
Dec. 2006			59	
March 2007			57	
June 2007	>100	>100	59	21
Sept. 2007	>100	>100	64	1.8
Dec. 2007			67	
March 2008			65	
June 2008	>100	>100	58	18
Sept. 2008	>100	>100	67	15
Min	>100	>100	57	1.8
Max	>100	>100	67	21.0
Avg.	>100	>100	61.36	14.3

Appendix C

Toxic Pollutants (2006-2008)

Date	Total Residual Chlorine (mg/l)		Copper (mg/l)	Lead (mg/l)	Zinc (mg/l)	Aluminum (mg/l)	Nickel (mg/l)	Cadmium (mg/l)	Chromium (mg/l)
	Avg.Monthly	Max.Daily	Max.Daily	Max.Daily	Max.Daily	Max.Daily	Max.Daily	Max.Daily	Max.Daily
Existing Limits	**1.0**	**1.0**	**Report**	**Report**	**Report**	**Report**	**Report**	**Report**	**Report**
Jan. 2006	0.83	0.99							
Feb. 2006	0.87	0.92							
March 2006	0.88	0.95							
April 2006	0.83	0.93							
May 2006	0.84	0.93							
June 2006	0.86	0.96	0.022	0.009	0.029	0.230	0.006	0.001	0.003
July 2006	0.86	0.93							
Aug. 2006	0.79	0.87							
Sept. 2006	0.83	0.96	0.012	0.005	0.019	0.043	0.005	0.001	0.002
Oct. 2006	0.86	0.98							
Nov. 2006	0.85	0.96							
Dec. 2006	0.82	0.92							
Jan. 2007	0.88	0.92							
Feb. 2007	0.83	0.91							
March 2007	0.82	0.88							
April 2007	0.83	0.89							
May 2007	0.84	0.91							
June 2007	0.84	0.90	0.010	0.005	0.017	0.084	0.003	0.001	0.002
July 2007	0.81	0.86							
Aug. 2007	0.85	0.93							
Sept. 2007	0.84	0.90	0.005	0.005	0.017	0.020	0.004	0.001	0.002
Oct. 2007	0.87	0.89							
Nov. 2007	0.88	0.93							
Dec. 2007	0.87	0.94							
Jan. 2008	0.89	0.95							
Feb. 2008	0.86	0.95							
March 2008	0.89	0.96							
April 2008	0.89	0.94							
May 2008	0.88	0.94							
June 2008	0.88	0.92	0.033	0.002	0.059	0.230	0.021	0.006	0.010

Appendix C

Toxic Pollutants (2006-2008)

Date	Total Residual Chlorine (mg/l)		Copper (mg/l)	Lead (mg/l)	Zinc (mg/l)	Aluminum (mg/l)	Nickel (mg/l)	Cadmium (mg/l)	Chromium (mg/l)
	Avg.Monthly	Max.Daily	Max.Daily	Max.Daily	Max.Daily	Max.Daily	Max.Daily	Max.Daily	Max.Daily
Existing Limits	**1.0**	**1.0**	**Report**	**Report**	**Report**	**Report**	**Report**	**Report**	**Report**
July 2008	0.86	0.92							
Aug. 2008	0.88	0.98							
Sept. 2008	0.89	0.92	0.009	0.001	0.014	0.120	0.007	0.005	0.002
Min	0.79	0.86	0.005	0.005	0.017	0.020	0.003	0.001	0.002
Max	0.89	0.99	0.033	0.009	0.059	0.230	0.021	0.006	0.010
Avg.	0.85	0.93	0.015	0.005	0.026	0.121	0.008	0.003	0.004

Note: Highlighted values indicate that the results were reported as "<"

Appendix D

NH, VT, and MA POTW Discharges of Nitrogen to the Connecticut River Watershed

FACILITY NAME	PERMIT NUMBER	DESIGN FLOW (MGD)[1]	AVERAGE FLOW (MGD)[2]	TOTAL NITROGEN (mg/l)[3]	TOTAL NITROGEN - Existing Flow(lbs/day)[4]
NEW HAMPSHIRE					
Bethlehem Village District	NH0100501	0.340	0.220	19.600	35.962
Charlestown WWTF	NH0100765	1.100	0.360	19.600	58.847
Claremont WWTF	NH0101257	3.890	1.610	14.060	188.789
Colebrook WWTF	NH0100315	0.450	0.230	19.600	37.597
Groveton WWTF	NH0100226	0.370	0.290	19.600	47.405
Hanover WWTF	NH0100099	2.300	1.440	30.000	360.288
Hinsdale WWTF	NH0100382	0.300	0.300	19.600	49.039
Keene WWTF	NH0100790	6.000	3.910	12.700	414.139
Lancaster POTW	NH0100145	1.200	1.080	8.860	79.804
Lebanon WWTF	NH0100366	3.180	1.980	19.060	314.742
Lisbon WWTF	NH0100421	0.320	0.146	19.600	23.866
Littleton WWTF	NH0100153	1.500	0.880	10.060	73.832
Newport WWTF	NH0100200	1.300	0.700	19.600	114.425
Northumberland Village WPCF	NH0101206	0.060	0.060	19.600	9.808
Sunapee WPCF	NH0100544	0.640	0.380	15.500	49.123
Swanzey WWTP	NH0101150	0.167	0.090	19.600	14.712
Troy WWTF	NH0101052	0.265	0.060	19.600	9.808
Wasau Paper (industrial facility)	NH0001562		5.300	4.400	194.489
Whitefield WWTF	NH0100510	0.185	0.140	19.600	22.885
Winchester WWTP	NH0100404	0.280	0.240	19.600	39.231
Woodsville Fire District	NH0100978	0.330	0.230	16.060	30.806
New Hampshire Total		**24.177**	**19.646**		**2169.596**

Appendix D

NH, VT, and MA POTW Discharges of Nitrogen to the Connecticut River Watershed

FACILITY NAME	PERMIT NUMBER	DESIGN FLOW (MGD)1	AVERAGE FLOW (MGD)2	TOTAL NITROGEN (mg/l)3	TOTAL NITROGEN – Existing Flow(lbs/day)4
VERMONT					
Bellows Falls	VT0100013	1.405	0.610	21.060	107.141
Bethel	VT0100048	0.125	0.120	19.600	19.616
Bradford	VT0100803	0.145	0.140	19.600	22.885
Brattleboro	VT0100064	3.005	1.640	20.060	274.373
Bridgewater	VT0100846	0.045	0.040	19.600	6.539
Canaan	VT0100625	0.185	0.180	19.600	29.424
Cavendish	VT0100862	0.155	0.150	19.600	24.520
Chelsea	VT0100943	0.065	0.060	19.600	9.808
Chester	VT0100081	0.185	0.180	19.600	29.424
Danville	VT0100633	0.065	0.060	19.600	9.808
Lunenberg	VT0101061	0.085	0.080	19.600	13.077
Hartford	VT0100978	0.305	0.300	19.600	49.039
Ludlow	VT0100145	0.705	0.360	15.500	46.537
Lyndon	VT0100595	0.755	0.750	19.600	122.598
Putney	VT0100277	0.085	0.080	19.600	13.077
Randolph	VT0100285	0.405	0.400	19.600	65.386
Readsboro	VT0100731	0.755	0.750	19.600	122.598
Royalton	VT0100854	0.075	0.070	19.600	11.442
St. Johnsbury	VT0100579	1.600	1.140	12.060	114.662
Saxtons River	VT0100609	0.105	0.100	19.600	16.346
Sherburne Fire Dist.	VT0101141	0.305	0.300	19.600	49.039
Woodstock WWTP	VT0100749	0.055	0.050	19.600	8.173
Springfield	VT0100374	2.200	1.250	12.060	125.726
Hartford	VT0101010	1.225	0.970	30.060	243.179
Whitingham	VT0101109	0.015	0.010	19.600	1.635
Whitingham Jacksonville	VT0101044	0.055	0.050	19.600	8.173
Cold Brook Fire Dist.	VT0101214	0.055	0.050	19.600	8.173
Wilmington	VT0100706	0.145	0.140	19.600	22.885
Windsor	VT0100919	1.135	0.450	19.600	73.559

Appendix D

NH, VT, and MA POTW Discharges of Nitrogen to the Connecticut River Watershed

FACILITY NAME	PERMIT NUMBER	DESIGN FLOW (MGD)1	AVERAGE FLOW (MGD)2	TOTAL NITROGEN (mg/l)3	TOTAL NITROGEN – Existing Flow(lbs/day)4
Vermont					
Windsor-Weston	VT0100447	0.025	0.020	19.600	3.269
Woodstock WTP	VT0100757	0.455	0.450	19.600	73.559
Woodstock-Taftsville	VT0100765	0.015	0.010	19.600	1.635
Vermont Totals		**15.940**	**10.960**		**1727.302**

FACILITY NAME	PERMIT NUMBER	DESIGN FLOW (MGD)1	AVERAGE FLOW (MGD)2	TOTAL NITROGEN (mg/l)3	TOTAL NITROGEN – Existing Flow(lbs/day)4
MASSACHUSETTS					
Amherst	MA0100218	7.100	4.280	14.100	503.302
Athol	MA0100005	1.750	1.390	17.200	199.393
Barre	MA0103152	0.300	0.290	26.400	63.851
Belchertown	MA0102148	1.000	0.410	12.700	43.426
Charlemont	MA0103101	0.050	0.030	19.600	4.904
Chicopee	MA0101508	15.500	10.000	19.400	1617.960
Easthampton	MA0101478	3.800	3.020	19.600	493.661
Erving #1	MA0101516	1.020	0.320	29.300	78.196
Erving #2	MA0101052	2.700	1.800	3.200	48.038
Erving #3	MA0102776	0.010	0.010	19.600	1.635
Gardner	MA0100994	5.000	3.700	14.600	450.527
Greenfield	MA0101214	3.200	3.770	13.600	427.608
Hadley	MA0100099	0.540	0.320	25.900	69.122
Hardwick G	MA0100102	0.230	0.140	14.600	17.047
Hardwick W	MA0102431	0.040	0.010	12.300	1.026
Hatfield	MA0101290	0.500	0.220	15.600	28.623
Holyoke	MA0101630	17.500	9.700	8.600	695.723
Huntington	MA0101265	0.200	0.120	19.600	19.616
Monroe	MA0100188	0.020	0.010	19.600	1.635
Montague	MA0100137	1.830	1.600	12.900	172.138
N Brookfield	MA0101061	0.760	0.620	23.100	119.445
Northampton	MA0101818	8.600	4.400	22.100	810.982
Northfield	MA0100200	0.280	0.240	16.800	33.627
Northfield School	MA0032573	0.450	0.100	19.600	16.346
Old Deerfield	MA0101940	0.250	0.180	9.200	13.811
Orange	MA0101257	1.100	1.200	8.600	86.069
Palmer	MA0101168	5.600	2.400	18.800	376.301

Appendix D

NH, VT, and MA POTW Discharges of Nitrogen to the Connecticut River Watershed

FACILITY NAME	PERMIT NUMBER	DESIGN FLOW (MGD)1	AVERAGE FLOW (MGD)2	TOTAL NITROGEN (mg/l)3	TOTAL NITROGEN – Existing Flow(lbs/day)4
Massachusetts					
Royalston	MA0100161	0.040	0.070	19.600	11.442
Russell	MA0100960	0.240	0.160	19.600	26.154
Shelburne Falls	MA0101044	0.250	0.220	16.900	31.008
South Deerfield	MA0101648	0.850	0.700	7.900	46.120
South Hadley	MA0100455	4.200	3.300	28.800	792.634
Spencer	MA0100919	1.080	0.560	13.600	63.517
Springfield	MA0103331	67.000	45.400	4.300	1628.135
Sunderland	MA0101079	0.500	0.190	8.700	13.786
Templeton	MA0100340	2.800	0.400	26.400	88.070
Ware	MA0100889	1.000	0.740	9.400	58.013
Warren	MA0101567	1.500	0.530	14.100	62.325
Westfield	MA0101800	6.100	3.780	20.400	643.114
Winchendon	MA0100862	1.100	0.610	15.500	78.855
Woronoco Village	MA0103233	0.020	0.010	19.600	1.635
Massachusetts Totals		**166.010**	**106.950**		**9938.820**

1. Design flow – typically included as a permit limit in MA and VT but not in NH.
2. Average discharge flow for 2004 – 2005. If no data in PCS, average flow was assumed to equal design flow.
3. Total nitrogen value based on effluent monitoring data. If no effluent monitoring data, total nitrogen value assumed to equal average of MA secondary treatment facilities (19.6 mg/l), average of MA seasonal nitrification facilities (15.5 mg/l), or average of MA year-round nitrification facilities (12.7 mg/l). Average total nitrogen values based on a review of 27 MA facilities with effluent monitoring data. Facility is assumed to be a secondary treatment facility unless ammonia data is available and indicates some level of nitrification.
4. Current total nitrogen load.

Total Nitrogen Load = 13,836 lbs/day
MA (41 facilities) = 9,939 lbs/day (72%)
VT (32 facilities) = 1,727 lbs/day (12%)
NH (21 facilities) = 2170 lbs/day (16%)
TMDL Baseline Load = 21,672 lbs/day

TMDL Allocation = 16,254 lbs/day (25% reduction)

Appendix E

Mass Limits, 7Q10 Flow and Dilution Factor Calculations

1. CALCULATION OF MASS LIMITS

Maximum allowable loads for average monthly, average weekly, and maximum daily BOD5 and TSS are based on the following equation:

$$L = 8.345 * Q * C$$

Where:

L = Maximum allowable load, in lbs/day, rounded to the nearest 1 lbs/day
C = Maximum allowable effluent concentration (concentration limit)
Q = Treatment plant's design flow, in MGD
8.345 = Factor to convert effluent concentration, in mg/l, and plant's design flow, in MGD, to lbs/day

Average Monthly Mass Limit (lbs/day) = 30 mg/l * 1.1 MGD * 8.34 = 275 lbs/day

Average Weekly Mass Limit (lbs/day) = 45 mg/l * 1.1 MGD * 8.34 = 413 lbs/day

Maximum Daily Mass Limit (lbs/day) = 50 mg/l * 1.1 MGD * 8.34 = 459 mg/l

2. DERIVATION OF 7Q10 FLOW AT OUTFALL 001 AND DILUTION FACTOR CALCULATION

DERIVATION OF 7Q10 FLOW AT OUTFALL 001

The nearest United States Geological Survey (USGS) flow gage to the Charlestown WWTP is located eight miles downstream in the Connecticut River in North Walpole, New Hampshire (USGS gage No. 01154500). In addition, the Williams River flows into the Connecticut River approximately four miles upstream from the North Walpole, NH gage. The entire drainage area contributing flow to the North Walpole gage is 5,493 square miles (mi^2), and the intervening drainage area between the facility and the North Walpole gage (excluding the Williams River) is 25.23 mi^2. The USGS flow gage in the Williams River closest to where it flows into the Connecticut River is located near Rockingham, VT (USGS Gage No. 01153500). The drainage area contributing to the Williams River gage is 112 mi^2, and the intervening drainage area between the Williams River gage and the confluence with the Connecticut River is 5.43 mi^2.

The 7Q10 flow of the Connecticut River at the point where the Charlestown WWTP discharge outfall is located was estimated by subtracting the proportional flows in both the Williams

Appendix E

Mass Limits, 7Q10 Flow and Dilution Factor Calculations

River and the Connecticut River from the 7Q10 flow of the Connecticut River at the USGS gage in North Walpole, NH using the following information and the steps summarized below:

- Connecticut River Flow at USGS gage No. 01154500 (North Walpole, NH)
  Drainage Area: 5,493 mi^2
  7Q10 flow at gage: 1387.29 cfs

- Drainage area in the Connecticut River from the Charlestown WWTP to USGS gage No. 01154500 (North Walpole, NH):

  Drainage Area: 25.23 mi^2 (excluding the Williams River watershed)

- Williams River flow at USGS gage No. 01153500 (Rockingham, VT):

  Drainage area: 112 mi^2
  7Q10 flow at gage: 9.295 cfs

- Drainage area in the Williams River from USGS gage No. 01153500 (Rockingham, VT) to the river's confluence with the Connecticut River:

  Drainage Area: 5.43 mi^2

1. Calculate a 7Q10 flow factor (cfs/mi^2) for the Connecticut River by dividing the 7Q10 flow at USGS gage No. 01154500 (North Walpole, NH) by the drainage area at the gage.

$$7Q10 \text{ flow factor} = 1387.29 \text{ cfs}/5{,}493 \text{ mi}^2 = 0.2526 \text{ cfs/mi}^2$$

2. Determine the 7Q10 flow in the intervening segment in the Connecticut River from the Charlestown WWTP to USGS gage No. 01154500 (North Walpole, NH) by multiplying the 7Q10 flow factor (0.2526 cfs/mi^2) by the intervening drainage area (25.23 cfs/mi^2).

$$7Q10_{\text{Conecticut River Charlestown WWTP to USGS gage}} = 0.2526 \text{ cfs/ mi}^2 * 25.23 \text{ mi}^2 = 6.37 \text{ cfs}$$

3. Determine a 7Q10 flow factor (cfs/mi^2) for the Williams River by dividing the 7Q10 flow at USGS gage No. 01153500 (Rockingham, VT) by the drainage area at the gage.

$$7Q10 \text{ flow factor} = 9.295 \text{ cfs}/112 \text{ mi}^2 = 0.083 \text{ cfs/mi}^2$$

4. Multiply the 7Q10 flow factor for the Williams River by the drainage area between USGS gage No. 01153500 (Rockingham, VT) and the river's confluence with the Connecticut River to determine the 7Q10 flow of the intervening segment of the river.

$$7Q10_{\text{gage to Connecticut River}} = 0.083 \text{ cfs/mi}^2 * 5.43 \text{ mi}^2 = 0.451 \text{ cfs}$$

Appendix E

Mass Limits, 7Q10 Flow and Dilution Factor Calculations

5. Add the 7Q10 flow at USGS gage No. 01153500 (Rockingham, VT) to the 7Q10 flow of the segment of the Williams River between USGS gage No. 01153500 (Rockingham, VT) and the Williams River's confluence with the Connecticut River to determine the total 7Q10 flow in the Williams River.

$$7Q10_{\text{Williams River}} = 9.25 \text{ cfs} + 0.451 \text{ cfs} = 9.75 \text{ cfs}$$

6. Subtract both the total 7Q10 flows in the Williams River and the segment of the Connecticut River between USGS gage No. 01154500 (North Walpole, NH) and the Charlestown WWTP to determine the 7Q10 flow in the Connecticut River at the Charlestown WWTP.

   $7Q10_{\text{Charlestown WWTP}} = 1387.29 \text{ cfs} - 9.75 \text{ cfs} - 6.37 \text{ cfs} = 1371.17 \text{ cfs}$

   Charlestown's drinking water supplies are from sources within the watershed upstream of the WWTF, and therefore the 7Q10 value calculated above is assumed to equal the 7Q10 streamflow downstream from the WWTF discharge.

3. DILUTION FACTOR CALCULATION

$$\text{Dilution Factor} = \frac{(Q_{\text{Charlestown WWTP}})}{Q_{PDF} \times 1.547 \text{ cfs/MGD}} \times 0.9$$

Where:

$Q_{\text{Charlestown WWTP}}$ = Estimated 7Q10 flow at the Charlestown WWTP, in cfs
Q_{DF} = Design flow of the facility, in MGD
1.547 cfs/MGD = Factor to convert MGD to cfs
0.9 = Factor to reserve 10% of the river's assimilative reserve capacity

$$\text{Dilution Factor} = \frac{(1371.17 \text{ cfs}) \times 0.9}{(1.1 \text{ MGD} \times 1.547 \text{ MGD/cfs})} = 725.2$$

Appendix F

Water Quality Criteria and Maximum Allowable Effluent Concentrations (Limits) for Metals

Metal	Dissolved Criteria (µg/l)[1]		Dilution Factor	Conversion Factor[2]		Total Recoverable Limit (µg/l)	
	Acute	Chronic		Acute	Chronic	Acute[4]	Chronic[5]
Lead[3]	14	0.54	725.2	0.993	0.993	10224	394
Copper	3.6	2.7	725.2	0.960	0.960	2720	2040
Zinc	36.2	36.5	725.2	0.978	0.986	26843	26846
Nickel	144.9	16.1	725.2	0.998	0.997	105292	11711
Aluminum	750	87	725.2	NA	NA	543900	63092
Chromium	183	24	725.2	0.316	0.860	419973	20238
Cadmium[3]	0.95	0.80	725.2	1.002	0.967	688	600

[1] The values for acute and chronic freshwater dissolved metals criteria are found in the New Hampshire Water Quality Standards at Env-Wq 1703.21, Table 1703.1. These values are based on a total hardness value of 25 mg/l or less, in accordance with footnote f of Table 1703.1.

[2] Conversion factors are used to convert between dissolved and total recoverable metals. In accordance with 40 CFR § 122.45(c), permit limits are to be expressed in terms of total recoverable metals. Conversion factors are found at Env-Wq 1703.21, Table 1703.2 (also see *EPA Metal Translator Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criteria*, EPA 1996 [EPA-823-B96-007]).

[3] Lead Acute and Chronic Conversion Factor = 1.46203 - [(Ln(hardness)) (0.145712)] = 0.993
Cadmium Acute Conversion Factor = 1.136672 - [(Ln(hardness))(0.041838)] = 1.002
Cadmium chronic Conversion Factor = 1.101672 - [(Ln(hardness))(0.041838)] = 0.967

[4] Acute Limit (Maximum Daily Limit) = (Acute criterion)(Dilution Factor)/Conversion Factor

[5] Chronic Limit (Average Monthly Limit) = (Chronic criterion)(Dilution Factor)/Conversion Factor